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# EUROPEAN SCIENTIFIC NOTES

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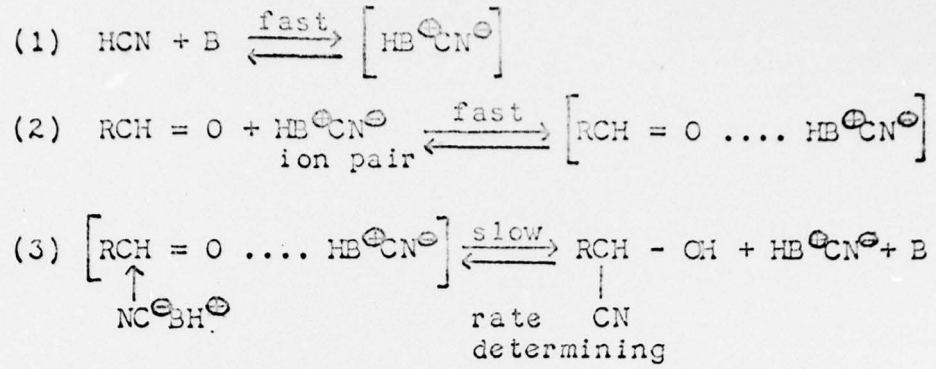
## A ONE BEV PROTON SYNCHROTRON AT DELFT

A proton synchrotron is being constructed at the Technical University of Delft under the direction of Prof. Heyn. This machine is a conventional four quadrant synchrotron with n less than 1, a radius of 4 meters and a design energy of 1 Bev. It uses an H-shaped magnet cross-section, like the Berkeley bevatron. The magnet gap is 10 x 30 centimeters, all of which will be available for acceleration since the magnet poles themselves will form the top and bottom of the vacuum chamber. The injector will be a 10 Mev cyclotron.

The machine is to be housed in a small building which was completed six months ago. The present status of construction is that aluminum coils for the magnets are now being wound and steel deliveries are just beginning. The present schedule calls for the machine to be completed in 1956.

## THE FORMATION OF ASYMMETRIC CYANHYDRINS

The mechanism cited in textbooks for cyanhydrin formation involves the addition of cyanide ion to the carbonyl function. It has been assumed that the only function of the base used as a catalyst is to furnish cyanide ion. In 1912 Bredig observed that when an optically active base, such as quinine, is used as a catalyst the mandelonitrile formed from benzaldehyde and hydrogen cyanide shows some optical activity. In reinvestigating and extending this early observation, Prof. Prelog at ETH in Zurich has obtained definite evidence that the base has other functions than merely to supply cyanide ion. In order to explain the production of an optically active product, Prelog has suggested the following mechanism for cyanhydrin formation

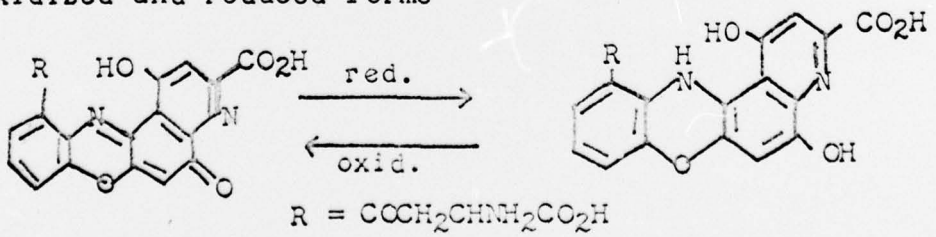


It will be observed that a hydrogen bonded complex between the base and the carbonyl function is postulated. This suggestion would account for the partial steric control during the addition of cyanide ion.

In the addition of hydrogen cyanide to cinnamaldehyde with quinine as the catalyst, a 45 - 55 ratio of isomers is obtained, although only 50 mg of catalyst for 20 g of aldehyde are used. As would be expected from this mechanism, the use of a mixture of an optically active and optically inactive base leads to a corresponding decrease in the stereospecificity of the addition, although the overall rate of the reaction remains substantially proportional to the total base present.

## INSECT EYE PIGMENTS

A group working with Prof. A. Butenandt at the Max Planck Institute for Biochemistry in Tübingen has determined the structure of xanthommatin, the principal eye pigment of califera (black fly). The substance has a phenoxazone ring system, a structure which has been used in photographic sensitizing dyes for many years. It is most interesting that a pigment found in insect eyes should thus turn out to be closely related to a chemical used in the photographic process and suggests that the structure may play a similar role in light absorption in the two cases. Xanthommatin can be represented by the following two formulas, which illustrate the oxidized and reduced forms



R = $COCH_2CH(NH_2)CO_2H$

In one experiment starting with 5,000 black flies, extraction and fractional precipitation produced approximately 160 mg of a reddish violet amorphous powder, which was further purified by chromatography to yield crystalline xanthommatin. Flies for the experiments are grown on putrefying meat in a special room at the Institute.

## THE PREPARATION OF RARE EARTH METALS

The Chemical Research Laboratory, Teddington, recently held a series of "open days" during which the various activities of the Laboratory were exhibited.

One of the problems currently under investigation involves the preparation of rare earth metals by the thermal reduction of rare earth halides with alkali metals. The technique used is that introduced by Gray (Bull. Inst. Mining Metallurgy 61, 141 (1951-2)). The reactants are placed in a molybdenum crucible which is enclosed in a mild steel reactor. After filling the reactor with argon, the reduction is initiated by heating to approximately 1000°C. Exploratory experiments are now being carried out with cerium and lanthanum fluorides using lithium as the reductant.

## THE USE OF ZONE-MELTING TO PURIFY ORGANIC COMPOUNDS

The Chemical Research Laboratory is also making use of zone melting techniques to purify certain organic compounds. A very vivid yet simple demonstration of the effectiveness of zone melting is provided by the system induline-naphthalene. As little as 0.03% induline imparts an intense blue color to naphthalene, which is colorless when pure and melts at 80.2°C. By placing the impure naphthalene in a vertical glass tube and slowly passing a molten zone from top to bottom, the induline is concentrated in the lower portion of the column. The progress of purification is readily followed by the accompanying color changes.

## NEW GRAVITY MAP OF JAPAN

At the 10th meeting of the International Union of Geodesy and Geophysics in Rome, Dr. C. Tsuboi of the Institute of Geophysics of Tokyo University revealed a new detailed gravity map of Japan. This map is based on a network of 4,500 stations covering the four main islands of Japan (Hokkiado, Honshu, Shikoku, and Kyushu). The measurements

were made by the Earthquake Research Institute and the Geographical Survey Institute using a Worden gravity meter which permits an observation to be made in a few minutes. A map of the Bouguer anomalies shows positive anomalies as high as +230 milligals and negative anomalies as low as -90 milligals.

For the most part, Japan is strongly positive although strongly negative pockets are present in central Honshu, in the south coast of Hokkaido, and on the east coast of Kyushu. Like the geological structures the gravity trends are parallel to the length of Japan. The Pacific coast of Japan is generally strongly positive, thus forming a gravity high which is parallel to the trenches off Japan which are known from earlier work to have great negative anomalies. The Median Tectonic Line, a Mesozoic-aged thrust fault traversing Kyushu, Shikoku, and southern Honshu, appears to strongly affect the gravity pattern. However, the younger Fossa Magna or "broken back" of Japan, which cuts across central Honshu in the vicinity of Tokyo, presents a rather confused gravity picture.

## THICKNESS OF THE GREENLAND ICE CAP

From 1949 to 1952 seismic measurements have been made on the Greenland Ice Cap by the excellently equipped French Polar Expeditions. The object has been to obtain knowledge of the physical characteristics of the cap and especially of its thickness and to get a general idea of the form and nature of the underlying bedrock.

The velocity of propagation of sound in the ice varied from 3800 to 4000 m/s. Underneath the ice, two rocky layers have been found. In the first layer, which has a thickness of 250 - 300 m, the velocity is 4800 to 5000 m/s; in the second layer the velocity is about 5450 m/s. At one station a velocity of 6650 m/s was observed in a layer. The velocity of sound in the ice and the rocky layers was determined by refraction shooting and the thickness was obtained by reflection shooting.

The thickness of the ice was determined at about 400 points spread out on several profiles in the southern half of Greenland and along one profile in the northern part of the ice cap. Two E-W cross sections show that, in the north and central parts of the cap, the bedrock forms a dish-shaped basin with the rock elevation of central Greenland being only 200 m above sea level. The bedrock of

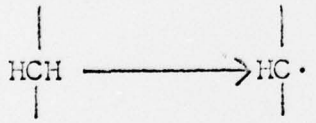
the southern part of Greenland forms a plateau with an elevation of about 1000 m. The ice volume of the entire cap is computed to be 2.7 x 10⁶ km3.

## VITAMIN $B_1$ DEFICIENCY AND LEARNING

Prof. Roger Russell and Dr. R. Watson, Department of Psychology, University College, London, have been conducting experiments on rats to measure the behavioral effects of vitamin $B_1$ deprivation. Like other experimenters they have found that animals deprived of vitamin $B_1$ perform more poorly in a learning situation. However, Russell and Watson question the validity of considering this lowering of performance as a direct effect of the vitamin deficiency. The food intake of animals deprived of $B_1$ is lower than that of normal animals and, in the experiments which Russell and Watson have completed, a control group of animals was fed a diet normal in quality but reduced in amount to that eaten by the vitamin $B_1$ deficient group. These "calorie deficient" animals showed a decrease in learning ability comparable to that found for the vitamin deficient group.

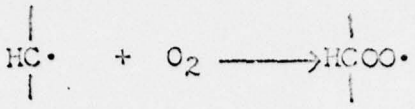
## PROTECTION AND REPAIR OF MACROMOLECULES EXPOSED TO IONIZING RADIATIONS

At the recent Symposium on Radiobiology held at Liege, Belgium, Dr. Peter Alexander of the Chester Beatty Research Institute, London, discussed the results of studies in collaboration with Dr. A. Charlesby of the Atomic Energy Research Establishment, Harwell. These workers have been concerned with the protection and repair of molecules subject to direct excitation by ionizing radiations [cf. ESN, 8, 90 (1954)]. They have worked chiefly with macromolecules such as polymethylmethacrylate and polyisobutylene. Such molecules may be converted to free radicals by loss of hydrogen.

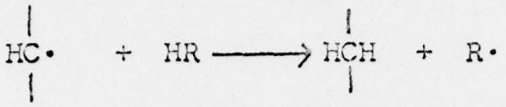



Two such molecules may combine to form a C - C crosslink between two macromolecules.

Alternatively in the presence of oxygen unstable peroxy-compounds which may decompose with accompanying main chain breakdown are formed



Before peroxy-compound formation the molecule can be repaired by hydrogen donors, notably -SH compounds



Another mechanism of protection of irradiated molecules discussed by Alexander involves the intramolecular transmission of energy. Using a series of substituted dodecanes (chiefly naphthyl substitution) it has been possible to show that:

1. Dodecanes in which a ring form permitting resonance is substituted for hydrogen require a greater exposure to ionizing radiations to effect main chain breakdown.

2. The position at which the ring is added is important, a ring near the center of the molecule exerting a greater protective effect.

These findings are interpreted to mean that the time required to accumulate sufficient energy in a C - C bond to effect rupture is at least of the same order of magnitude as that required to distribute the excitation energy throughout the degrees of freedom of the molecule. Thus there is an opportunity for the excitation energy to find its way into the energy sink provided by the resonant structure. Presumably it is subsequently dissipated by photon emission or other unspecified means.

## RESUMPTION OF PUBLICATION OF ZEITSCHRIFT FÜR KRISTALLOGRAPHIE

After an interval of almost ten years publication of the Zeitschrift für Kristallographie is to be resumed. The last issue to appear was Volume 106, No. 1, which was released in 1945. Volume 106, No. 2, is scheduled to appear in October 1954. Issues will be released irregularly thereafter. Persons in the United States wishing to order the journal may obtain it through Walter J. Johnson, Inc., 125 East 23rd Street, New York 10, New York.

PERSONAL NEWS ITEM

Dr. Raymond Latarjet has succeeded Dr. A. Lacassagne as Director of the Institut du radium (Laboratoire Pasteur).

TECHNICAL REPORTS OF ONRL

The following reports have been forwarded to ONR, Washington. Copies may be obtained by addressing requests to the Commanding Officer, Office of Naval Research Branch Office, Navy No. 100, c/o Fleet Post Office, New York, N. Y.

ONRL-72-54 "The Glasgow Conference on Nuclear Physics" by J. R. Richardson

ONRL-78-54 "Organic Chemical Research in Scandinavia" by J. C. Sheehan

ONRL-79-54 "Nuclear Physics in the Stockholm Area" by J. R. Richardson

ONRL-81-54 "Marine Biological Stations of England and Wal[illegible] by T. K. Ruebush

ONRL-82-54 "[illegible]tional Association of Gerontology [illegible] Congress" by W. D. Neff

ONRL-83-54 "Fluid Mechanics Institutes in Germany, Switzerland and Austria" by W. D. Hayes

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